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Assessing the Accuracy of the Fixed-Phi Method for Different CME Initial Speeds and Directions

Noe Lugaz and Ilia I. Roussev
Institute for Astronomy, University of Hawaii, Honolulu, HI, USA (nlugaz@ifa.hawaii.edu, iroussev@ifa.hawaii.edu)

In order to study CME kinematics in the heliosphere from white-light observations, it is essential to derive precisely the CME positions from the measured elongation angles. In this talk, we discuss one of the simplest and most commonly used approximations used to calculate CME positions from SECCHI measurements: the Fixed-Phi approximation. Our approach is to analyse synthetic line-of-sight images of CMEs produced from a global three-dimensional MHD simulation and to compare the position derived from elongation angles to the position in the 3-D simulation. By testing this approximation for different CME initial speeds and directions of propagation, we are able to quantify the error associated with the method. In particular, this approach is the only way to study the accuracy of this technique for fast CMEs, since there has been almost no fast events since the launch of STEREO. Also, because the elongation angle is not proportional to the radial distance, time-elongation plots of CMEs usually show an apparent deceleration or acceleration of the tracks at large elongation angles, which can be related to the direction of propagation of the CME with respect to the Sun-spacecraft line, assuming a constant propagation speed. We give preliminary results of the errors introduced by this method for fast CMEs propagating with different angles with respect to the STEREO-Sun line.